Impact of personal alcohol consumption on aspects of medical student alcohol-related competencies

Running title: Alcohol consumption impact on medical competencies

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Abstract

Aim:

Health professionals need to be competent to assess the level of alcohol use in patients. In this study, we aimed to explore how medical students' own alcohol consumption has an impact on their familiarity with alcohol brands, strengths and alcohol related harms.

Methods

As part of an investigation the concept of 'alcohol health literacy', this study combined an anonymous online survey, linked to an electronic alcohol 'brand' recognition game. Participants were medical students in their first clinical year. The survey recorded demographics, self-reported alcohol consumption (using the AUDIT-C), a visual test of relative alcohol concentrations of wine, beer and spirits, and a free-text response asking them to list alcohol-related harms. Participants then completed the brand recognition game, which recorded accuracy and reaction time for identifying alcohol drink brands.

Results

150 students participated. There was a significant effect of ethnicity on drinking status, with 48% of non-white participants scoring zero on the AUDIT-C. Students who reported any alcohol consumption were more likely to correctly assess relative alcohol concentrations, and faster and more accurate at recognizing alcohol brands, which was dose dependent.

Conclusions

Medical students' own levels of alcohol consumption had a significant impact on their ability to identify alcohol brands and estimate relative concentrations of alcohol. This may have an impact on how well they are able to assess alcohol consumption accurately in patients and has implications for how best to tailor the delivery of teaching and training about alcohol to ensure similar levels of clinical confidence regardless of personal experience.

Short summary

Health professionals need to be competent to assess the level of alcohol use in patients. Knowledge and attitudes are affected by their own level of alcohol consumption, and innovative teaching methods are required to ensure parity of confidence and competence in this area.

Introduction

Given the high prevalence of alcohol use disorders globally and their consequences in terms of morbidity, mortality and economic burden in the general population (Griswold et al., 2018), it is essential for doctors to be competent in the assessment of alcohol consumption (Sinclair et al., 2012). To take an accurate alcohol history from patients, health professionals need to be able to correctly estimate the number of units in commonly consumed alcohol-containing drinks, based on local patterns of alcohol consumption. Doctors who have had training in alcohol use disorders have greater confidence identifying and managing patients (Kaner et al., 2001, GMC, 2018), and doctors and students who do not drink alcohol themselves may be less confident to ask and record alcohol use in patients (Das et al., 2014).

Despite the barriers to teaching and learning in this area being well-known for decades (Walsh, 1995), recent studies of medical students and doctors show that levels of alcohol related competencies remain low (Das et al., 2009, Das et al., 2014, Sinclair and Searle, 2016, Kahan et al., 2007).

The concept of 'critical health literacy' is complex, requiring individuals (both doctors and patients) to access, understand, and critically analyse information to take action to overcome structural barriers to health (Nutbeam, 2000). People highly 'health literate' in one area can have a low level in another, and we argue that many health professional have low levels of 'alcohol specific health literacy', and are frequently unaware that this is the case. There are no standard measures of alcohol specific health literacy, and so in this study, we specifically explored the associations between medical students' personal alcohol consumption, and their ability to assess the relative strengths of alcoholic drinks, awareness of alcohol brands, and knowledge of alcohol-related harms. The ultimate aim is to identify potential ways to deliver teaching and training, based on individual learning needs of health professionals, to increase their competence in understanding alcohol related harms and how to assess it.

Methods

This study combined an online survey and electronic brand recognition game conducted in year three medical students (first clinical year) at the University of Southampton (UK), prior to a timetabled teaching session on alcohol. To minimize bias in terms of knowledge, students were recruited prior to their single formal teaching session, which limited the sample size possible to those who attended (N=150). An email with details of the study was sent to all students the week before their teaching session, inviting them to voluntarily take part by arriving 15 minutes prior to the start of the session. On arrival, any questions about the study were answered and students wishing to take part gave informed consent. The study received a favourable ethical opinion from the University of Southampton Research Ethics committee (ERGO/ 7709).

The survey

The survey was hosted by the University's online survey facility (iSurvey, 2017). It included questions on the students' demographics, a measure of their personal alcohol consumption, a picture task assessing understanding of the relative strengths of beer, wine and spirits, and an open ended question eliciting students' knowledge of alcohol-related harms.

Alcohol consumption was assessed using the first three (consumption) questions of the Alcohol Use Disorder Identification Test (AUDIT-C) (Bush et al., 1998), for consumption levels over the past year. AUDIT-C is a validated tool for alcohol screening, with scores ranging from zero (no alcohol consumption) to 12. A score of 5 or more is considered 'positive' for drinking above lower-risk levels in the general population (men and women) by Public Health England, and used as the benchmark for screening in the UK (NHS Livewell/alcohol).

Two picture questions assessed understanding of relative alcohol strengths. In both students were asked to rank, in descending order of alcohol content:

1. three glass beakers containing 250ml of vodka, beer and wine respectively.

2. three glass beakers containing 'standard measures' of each drink: 25ml of vodka (37.5% ABV = <1 unit), 250ml of beer (4-5% ABV = 1-1.25 units) 175ml of wine (12% ABV= 2.1 units).

Knowledge of alcohol harms was assessed through an open ended question asking students to list three harms of alcohol. Each answer was then coded thematically by a first rater, who iteratively developed a coding manual, categorising each harm first as 'physical', 'psychological' or 'social', and then further subdividing each category. The coding manual was then used by a second rater to blindly re-code all the answers. Any discrepancies between the first two raters were resolved by a third rater.

The brand recognition game

Having completed the survey, students played a brand recognition game (designed specifically for the project) on a tablet computer (iPad). The game presented students with three blocks of seven pictures. Each block included four pictures of branded alcohol drinks, two of non-alcohol brands (sweets and non-alcoholic drinks) and one control clipart image (pencil, book or car). The names of the brands were pixelated out of the images. All images were chosen to be familiar to people from general exposure to the brand in supermarkets, advertising and clip art standard images. Students were presented with one name (brand or object) at a time and asked to tap the correct picture as rapidly as possible. *(See supplementary material)*

Analysis

A multiple linear regression was conducted to assess the effect of students' demographics on their AUDIT-C scores.

The focus of the analysis on understanding alcohol strengths, alcohol harms and brand recognition tasks was to assess alcohol 'literacy' relative to personal alcohol consumption. Given the consistently reported differences in alcohol consumption by gender (men drink more) and ethnicity (Webb et al.,

1997, Gill, 2002, Newbury-Birch et al., 2000), we analysed the differences in task performances based on these demographics. Frequencies were compared using Chi Square and Fisher's Exact tests, while means were compared via Independent Samples T-Tests and one-way ANOVAs with post-hoc Bonferroni. Where variances were not homogenous, Welch ANOVA was reported. The significance threshold was set at 0.05.

In total, accuracy and reaction time was measured for twelve alcohol brands, six non-alcohol brands and three control images. Accuracy was calculated separately for the alcohol and non-alcohol brand groups, as a percentage of correctly identified brands in each. In order to control for speed of iPad use, the mean reaction time for the control cliparts was subtracted from the mean reaction time for each brand group.

Statistical analysis was completed using the SPSS software package (SPSS Inc, 2015).

Results

[Insert Table 1 here]

150 students participated. Significant differences in ethnicity were found between age groups, $\chi 2$ (3) = 25.12, $p<0.001$. In the 22-24 years age group 32 (59.3%) students were 'non-white', while in the other age groups, the proportion did not exceed 25% (see table 1).

Participants' alcohol consumption

Overall, 28 (18.7%) participants stated they never drank alcohol, 52 (34.7%) scored in the low-risk range (1-4 on AUDIT-C) and 70 (46.7%) scored in the increased-risk range (5-12 on AUDIT-C). There were significant group differences in terms of ethnicity, age and gender. Twenty-four (48%) non-white and 4 (4.0%) white students were non-drinkers, while 8 (16%) non-white and 62 (62%) white students scored in the increasing risk range, $\chi 2(2)=49.72$, $p<0.001$.

[Insert Figure 1 here]

In the 22-24 year age group, 20 (37.0%) of students were non-drinkers, compared to 8.6% or less in the other age groups. The proportion of low-risk drinkers rose with each step increase in age, from 28.6% (n=20) in the 19-21 age group, 31.5% (n=17) in the 22-24 group, 41.7% (n=5) in the 25-27 group to 71.4% (n=10) among the students older than 27, $\chi 2$ (6)=27.24, p<0.001. Among male students, 10 (16.9%) were non-drinkers, 14 (23.7%) were low-risk drinkers and 35 (59.3%) were increased-risk drinkers, compared to 18 (19.8%), 38 (41.8%) and 35 (38.5%) females respectively, $\chi 2$ (2)=6.848, p=0.033.

A multiple linear regression showed that ethnicity (β=0.54, p<0.001), age (β=-0.21, p=0.002) and gender (β =-0.13, p=0.044) significantly predicted the AUDIT-C score F(3, 146)=28.30, p<0.001, R^2=0.37.

Understanding of relative alcohol strengths

The majority of students (137, 91.3%) were able correctly to rank the 250ml drinks (suggesting a basic understanding of relative strengths of beer, wine and spirits). Significantly, seven (25.0%) participants who did not drink alcohol, were unable to correctly complete this task, compared to 3 (5.8%) low-risk drinkers and 3 (4.3%) increased-risk drinkers, $\chi 2(2)=9.18$, p=0.009. Four (4.0%) of the students who described themselves as 'white' were not able to correctly rank these drinks, compared to 9 (18.0%) non-white students, $\chi 2(1)=8.25$, p=0.010.

When the complexity of the task was increased by presenting students with differing volumes (representing a 'standard measure' for each drink), only 67 (44.7%) were able to correctly rank the 25ml of vodka, 250ml of beer and 175ml of wine, at average strengths, in order of alcohol content. Students who performed the task correctly had significantly higher AUDIT-C scores than their peers, t(148)=3.981, p<0.001. Significant differences were also found by drinking status, $\chi 2(2)=16.13$, p<0.001, and ethnic group, $\chi 2(1)=10.57$, p=0.001 (see Table 2), but there was no effect on either task of gender. Overall over half of subjects (73/140) gave incorrect answers and therefore there was poor knowledge in the whole group

[Insert Table 2 here]

Alcohol Harms

There was good inter-rater reliability between the two independent raters' categorisation of alcohol related harm (Cohen's kappa = 0.92). Almost all students (148, 98.7%) were able to name correctly three alcohol related harms. All but one student listed at least one physical harm of alcohol. Sixty-nine (46.0%) participants listed at least one psychological harm; male students (n=37, 62.7%) were more likely to list at least one psychological harm than female students (n=32, 35.2%), $\chi 2(1)=10.94$, p=0.010 . Twenty-five students (16.7%) listed at least one social harm. Between them, students listed 448 alcohol related harms; 342 (76.3%) physical harms, 79 (17.6%) psychological harms and 27 (6%) social harms.

Brand recognition Task

All students were tested on the accuracy and speed at which they recognized well-known brands of drinks (including alcohol) as well as sweets and snacks (see figure 2).

Overall, students were *more accurate* at recognizing non-alcohol brands (M=95.2%, SD=11.0) compared to alcohol brands (M=83.3%, SD=18.2), $t(149) = -9.05$, $p<0.001$. However, non-drinkers were significantly less likely than alcohol drinkers to correctly recognise alcohol compared with non-alcohol brands, $F(2, 58.50)=11.61$, $p<0.001$, and there was a 'dose-dependent' effect of increased accuracy of recognition of alcohol brands across the three AUDIT-C groups, $F(2, 60.07)=18.08$, $p<0.001$. This remained after Bonferroni correction was applied ($p\leq0.006$). Differences in accuracy were not significantly different between the two drinking risk level groups.

[Insert Figure 2 here]

White students were better at recognising alcohol brands, (mean difference=19.7%), t(63.14)=5.97, p<0.001, and non-alcohol brands, (mean difference=8.3%), t(56.07)=3.61, p=0.001, compared to non-white students.

Students were also *faster* at recognizing non-alcohol brands (M=0.30s, SD=0.29) than alcohol brands (M=0.51s, SD = 0.33), t(149)=8.04, p<0.001. Non-drinkers were significantly slower than those who drank alcohol at identifying an alcohol brand, F(2,147)=5.70, p=0.004, unlike the speed of identifying a non-alcohol brand, where there was no association with drinking status. Post-hoc testing showed a significant difference in speed of recognition of alcohol brands between non-drinkers and those in the increased risk group (p=0.003). Compared to non-white students, white students were quicker at recognising alcohol brands, (mean difference=0.14s), t(148)=-2.47, p=0.015, and non-alcohol brands, (mean difference=0.11s), t(148)=-2.16, p=0.033.

Discussion

Student alcohol consumption

'Avoiding alcohol misuse' is recognized as an essential component of medical professionalism across cultures (Chandratilake et al., 2012), and yet almost half of the students participating in our study screened positive for increased-risk drinking. This is consistent with previous data from other similar studies, which found 46-57% of UK medical students (who are a culturally diverse group) screen positive for increased risk drinking (Granville-Chapman et al., 2001, Sinclair and Searle, 2016), and 32.4% in a large US study (Jackson et al., 2016). As in the general population (Office for National Statistics, 2017), we found higher levels of drinking among males (83.1%) than females (80.2%).

However, ethnicity had a significant impact on alcohol intake, with 48% of the non-white medical students in our cohort stating they had not drank alcohol at all in the last year. This is similar with previous data from the UK, which showed 50% of non-white students did not drink alcohol (Webb et

al., 1997, Newbury-Birch et al., 2000). The relationship between student age and personal consumption of alcohol is not clear cut ((Wicki et al., 2010). In our study, there was a significant effect of age on mean AUDIT-C score. The interpretation of this, however, was complicated by the heterogeneous ethnic mix across the 4 age groups. The 22-24 age group had a significantly higher proportion of non-white students than the other age groups and, consequently, lower levels of alcohol consumption. The intake of international students into Year 3 undergraduate medicine course at Southampton University is likely to contribute to the demographic differences between the age categories. These students complete their preclinical work at the International Medical University, Malaysia, and University of Brunei Darussalam.

Implications for teaching and training

Being able to take an accurate history of patients' alcohol consumption, and reliably use validated tools (such as the AUDIT) has been described as a core competency for health professionals (Sinclair et al., 2012, NICE, 2011) , and requires a basic underpinning of alcohol health literacy to have the confidence to develop these competencies, yet this remain generally poor (Das et al., 2014, Sinclair and Searle, 2016, Butt et al., 2015). Work from New Zealand highlighted that medical students who drank alcohol and who spoke English as a first language performed significantly better in an alcohol competency test than students who did not (Cape et al., 2006). Our results from the relative alcohol strengths task and the brand recognition game echo these findings. Students who drank alcohol were both more accurate and faster at recognizing alcohol brands than students who did not drink. They also performed better in the assessment of relative alcohol strengths. The use of the iPad brand game was based on the 'attentional bias' methodology that is well established as a valid method of testing underlying cognitive processes and we adapted into a game for this study. Further research is required to fully test it, but it appears to have reasonable face validity, and the results

suggest that it was capturing a real difference in speed and accuracy of alcohol brand recognition based on familiarity.

Given the diversity of cultural background and first language of UK medical students, a significant minority potentially start at a disadvantage when learning about alcohol, than those with a life-long 'lay' familiarity and exposure to it, which may have a significant impact on their confidence to approach patients and take a full alcohol assessment. Factors, such as speaking English as a second language (Cape et al., 2006, Schmidt-Rinehart, 1994), may contribute to the challenge of understanding all the colloquial ways of referring to alcohol drinks. This may be particularly the case for international medical students joining UK-based students at the beginning of clinical years, and may be a challenge for International medical graduates working in countries with very different alcohol cultures.

Limitations

The generalizability of these results is limited by a relatively small sample from a single medical school in the UK. As a screening tool for increased-risk drinking, the AUDIT-C has evolved over time (Bush et al., 1998, Khadjesari et al., 2017). The different wording of the questions, different cutoffs and different international interpretations of standard drinks/units can make the comparison between studies challenging. However, the AUDIT-C can be used reliably as an indicator of increasing risk of drinking within a population, as we have done. To minimize bias, the questionnaire was anonymous and conducted online, with no ability to identify individual students, and students were reassured about this when consent was taken. As we used a version of the AUDIT-C which asks about 'units', international students may have found it difficult to give accurate answers. However, considering a large proportion of them did not drink at all, this effect would have been minimal. As alcohol standard drinks or 'units' are defined differently across countries, we limited the potential bias based against the international students in the assessment of relative alcohol strengths by the way the task was set up, asking students to rank drinks in order of their relative alcohol content,

rather than units. Despite these limitations, our study highlights broader challenges in teaching and learning around culturally determined behaviours that have a significant impact on health.

Conclusions

This study highlights that medical students (and by extension doctors) are diverse in terms of their own drinking behaviour and that this personal experience may have an impact on their training needs to enable them to reach parity in terms of confidence and competence to take an adequate alcohol history. Students who drink at increased risk (almost 50% in this study) may have different attitudes towards patients drinking than those who drink nothing (20%). This study focused on alcohol knowledge' aspects, but skills and confidence in assessing and managing alcohol use are also likely to be affected.

The electronic tablet (iPad) application development was based on attentional biases literature at a functional level, and whether this could form the basis for teaching resource using gamification principles and feedback to improve the alcohol specific health literacy of health professionals whose personal exposure to alcohol is limited requires further research. More broadly teaching and training strategies for those unfamiliar with alcohol also need review and evaluation.

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Conflict of Interest Statement

The authors report no declarations of interest.

Tables

Table 1: Participant demographics.

			Age group- n, (%)				**Total**
			19-21	**22-24**	**25-27**	**>27**	
		Male	34 (48.6)	14 (25.9)	5 (41.7)	6 (42.9)	59 (39.3)
		Female	36 (51.4)	40 (74.1)	7 (58.3)	8 (57.1)	91 (60.7)
Ethnicity	*White*	**White British**	56 (80.0)	20 (37.0)	11 (91.7)	11 (78.6)	98 (65.3%)
		White other	0	2 (3.7)	0	0	2 (1.3)
	Non-white	**Indian**	3 (4.3)	2 (3.7)	0	0	5 (3.3)
		Pakistani	1 (1.4)	1 (1.9)	0	0	2 (1.3)
		African	2 (2.9)	2 (3.7)	0	1 (7.1)	5 (3.3)
		Chinese	3 (4.3)	8 (14.8)	0	0	11 (7.3)
		Mixed	0	2 (3.7)	0	1 (7.1)	3 (2.0)
		Other	5 (7.1)	17 (31.5)	1 (8.3)	1 (7.1)	24 (16.0)
Total			70 (100%)	54 (100%)	12 (100%)	14 (100%)	150 (100%)

Legend: significant differences in ethnicity between age groups only, $\chi 2$ (3) = 25.118, p<0.001.

Table 2: Ranking of relative alcohol content of drinks

		AUDIT-C score		**Drinking status based on AUDIT-C (n, %)**			**Ethnicity (n, %)**	
		mean	SD	Non-drinker	Low risk	Increased risk	White	Non-white
Performance	Correct	5.22	2.73	4, 13.8%	23, 44.2%	40, 57.8%	54, 54.0%	13, 26.0%
	Incorrect	3.33	3.03	25, 86.2%	29, 55.8%	29, 42.0%	46, 46.0%	37, 74.0%
	Total	4.17	3.04	29, 100%	52, 100%	69, 100%	100, 100%	50, 100%

Legend

Correct: wine (2+units) >beer(1-2units) >vodka (<1 unit)

Non-drinker (AUDIT-C=0); Low risk AUDIT-C = 1-4; Increased risk AUDIT-C; =5+

**Includes white British + 'white other'*

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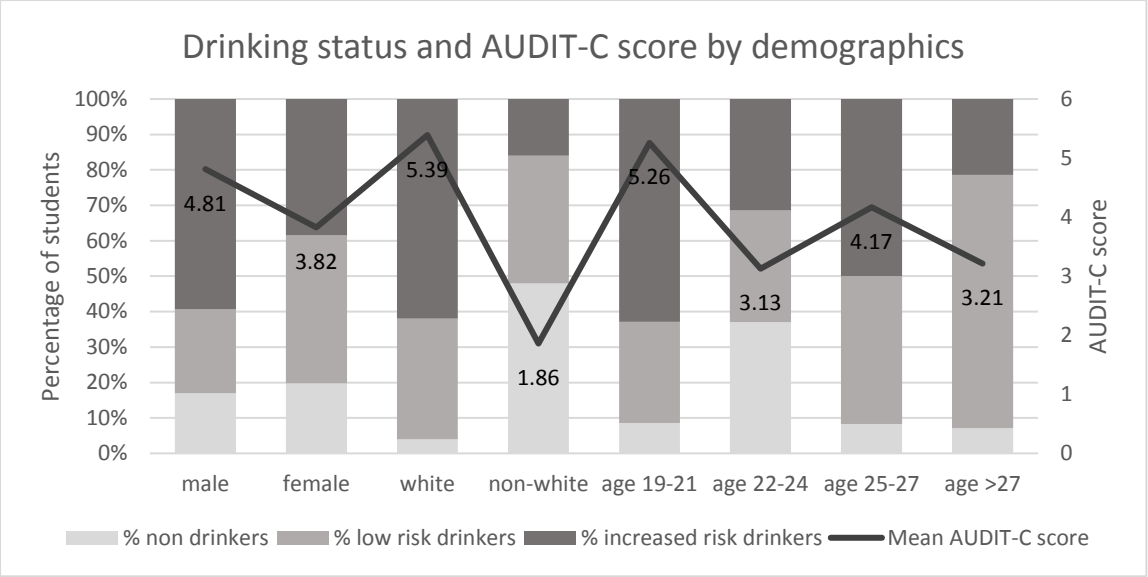
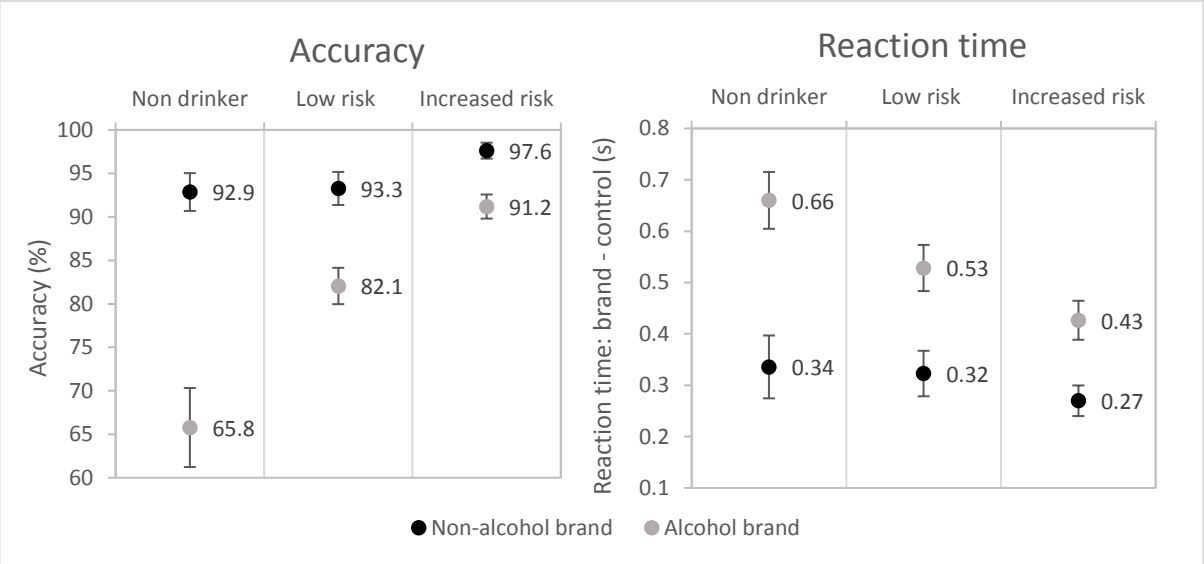
Figures

Figure 1. Drinking categories and mean AUDIT-C scores of participants.



Legend: Non drinkers: AUDIT-C score = 0. Low risk drinkers: AUDIT-C score 1-4. Increased risk drinkers: AUDIT-C score 5+

Figure 2: Mean accuracy and reaction times for alcohol and non-alcohol.



Legend: Non drinkers: AUDIT-C score = 0. Low risk drinkers: AUDIT-C score 1-4. Increased risk drinkers: AUDIT-C score 5+.